US007832977B2

(12) **United States Patent**
Brewer, III

(10) **Patent No.: US 7,832,977 B2**
(45) **Date of Patent: Nov. 16, 2010**

(54) **STACKER CARTS, PRINTING APPARATUSES, AND METHODS OF STACKING MEDIA ON STACKER CARTS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 295 days.

(21) Appl. No.: **12/174,794**

(22) Filed: **Jul. 17, 2008**

(65) **Prior Publication Data**

US 2010/0014951 A1 Jan. 21, 2010

(51) **Int. Cl.**
B65G 57/00 (2006.01)
B65H 31/00 (2006.01)
B65H 31/36 (2006.01)

(52) **U.S. Cl.** **414/788.9**; 414/789.9; 271/209; 271/221; 410/46

(58) **Field of Classification Search** 206/554, 206/600; 220/8; 270/58.18–58.19; 271/161, 271/163, 171, 188, 209, 217, 220; 414/331.06–331.09, 414/331.1, 331.11, 331.14, 331.15, 331.18, 414/593–594, 788, 788.9, 789.7, 789.9, 792.7, 414/793.4, 793.8, 794.6, 923; 493/412
See application file for complete search history.

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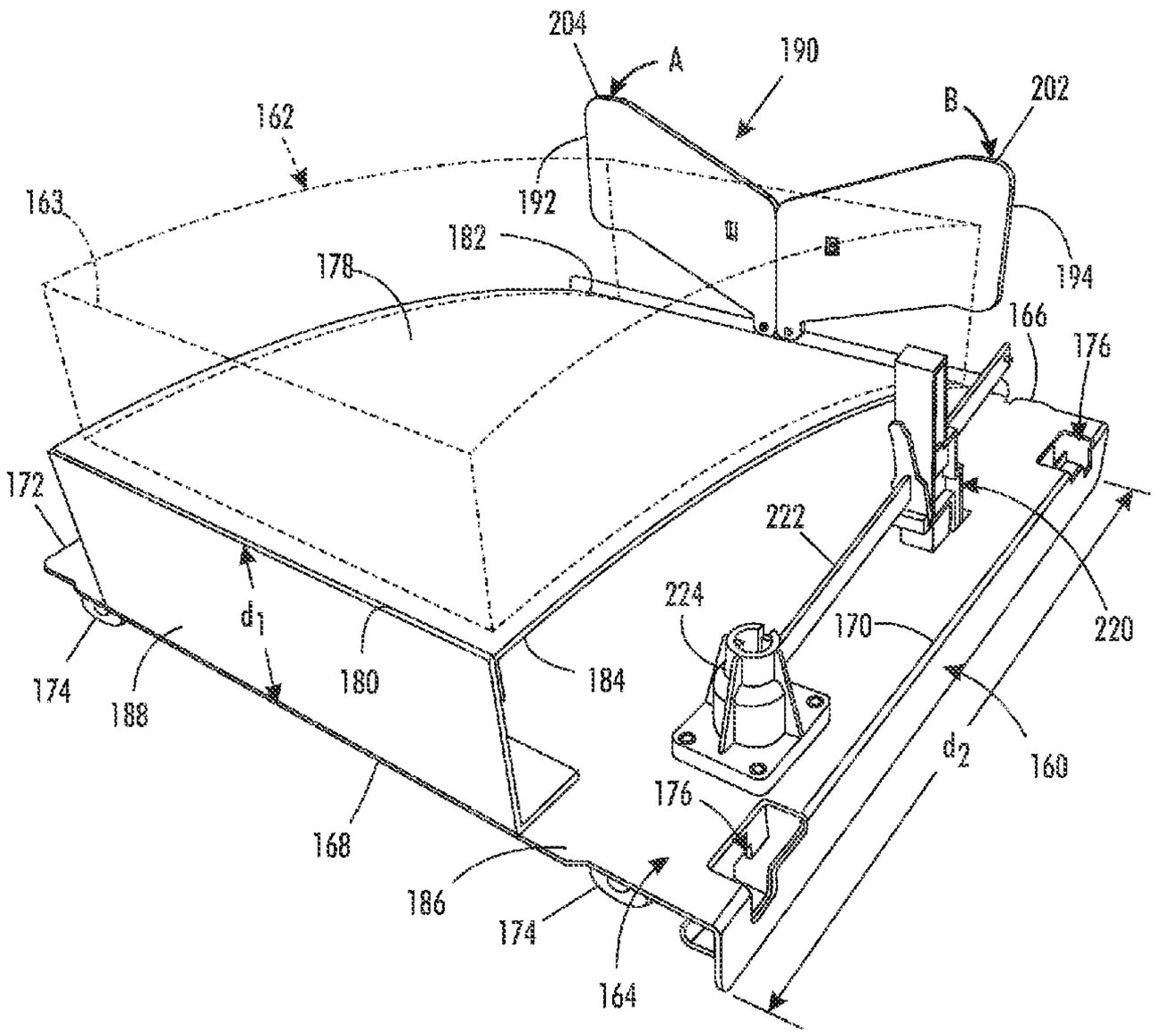
(57) **ABSTRACT**

Stacker carts for stacking media, printing apparatuses, and methods of stacking media on stacker carts are disclosed. An embodiment of the stacker carts includes a stacking surface including a first end and an opposite second end, the stacking surface sloping downwardly from the first end toward the second end; and a resiliently-biased stop at the second end of the stacking surface, the stop including at least one contact surface defining a height of the stop above the second end of the stacking surface. When the contact surface is in contact with a first surface, a height of the stop (i) decreases as the stacker cart is moved toward the first surface, and (ii) increases as the stacker cart is moved away from the first surface.

19 Claims, 5 Drawing Sheets



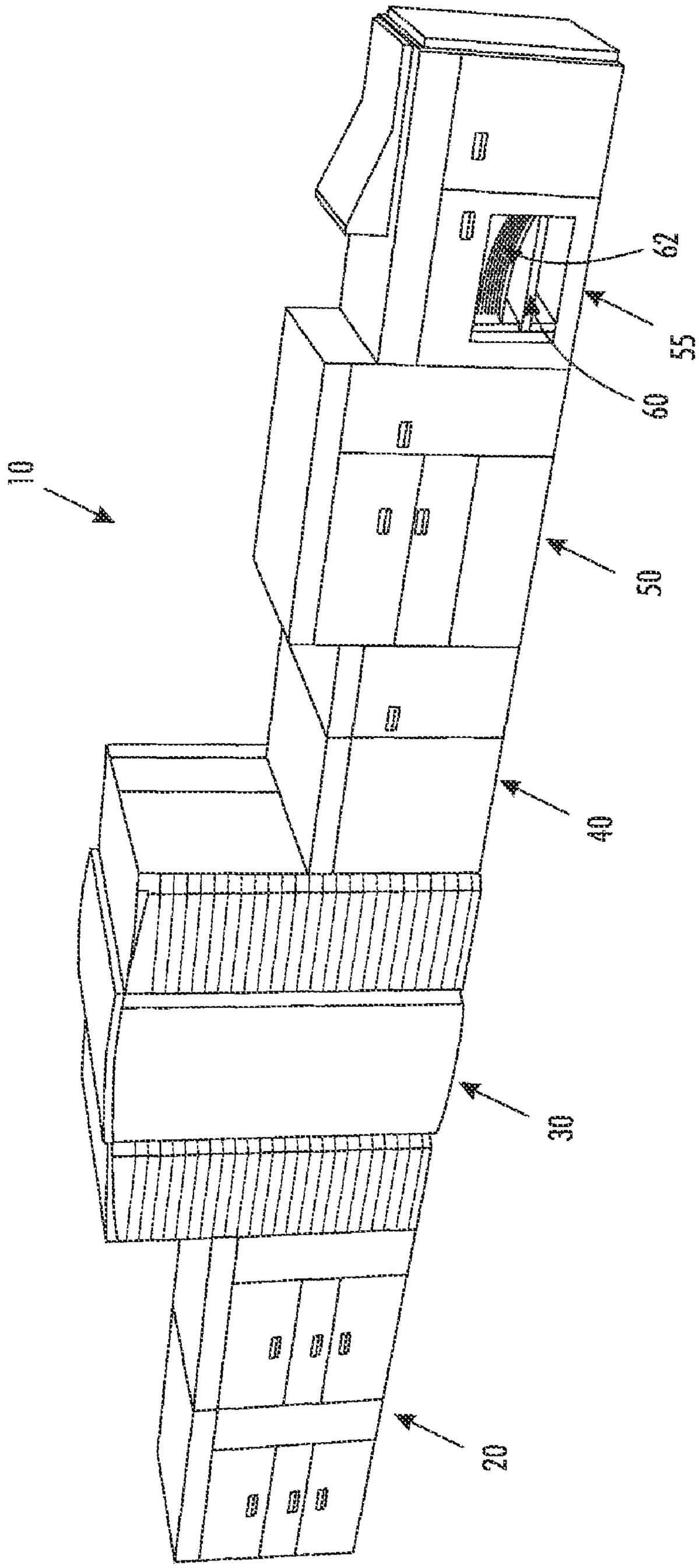


FIG. 1

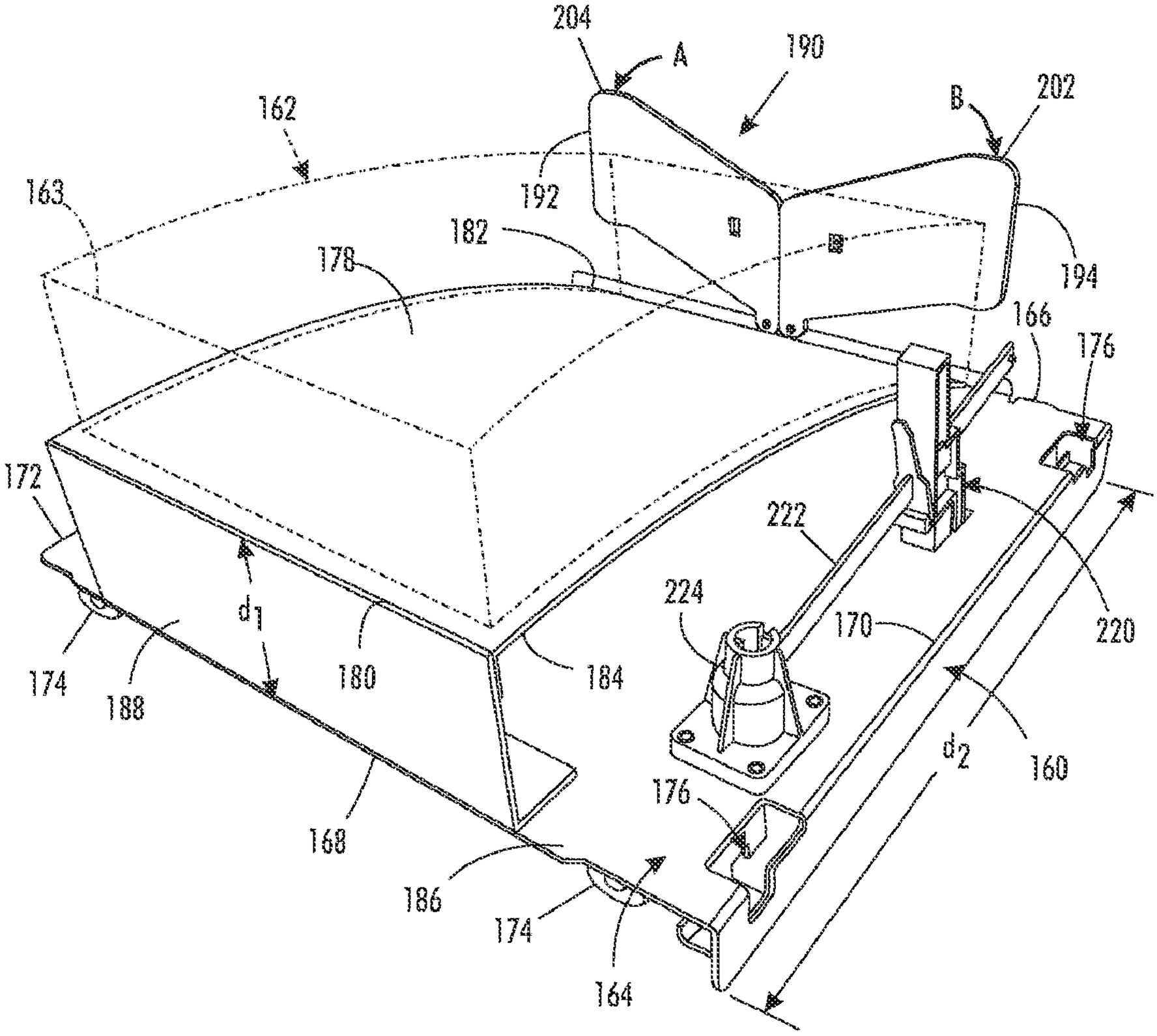

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FIG. 2

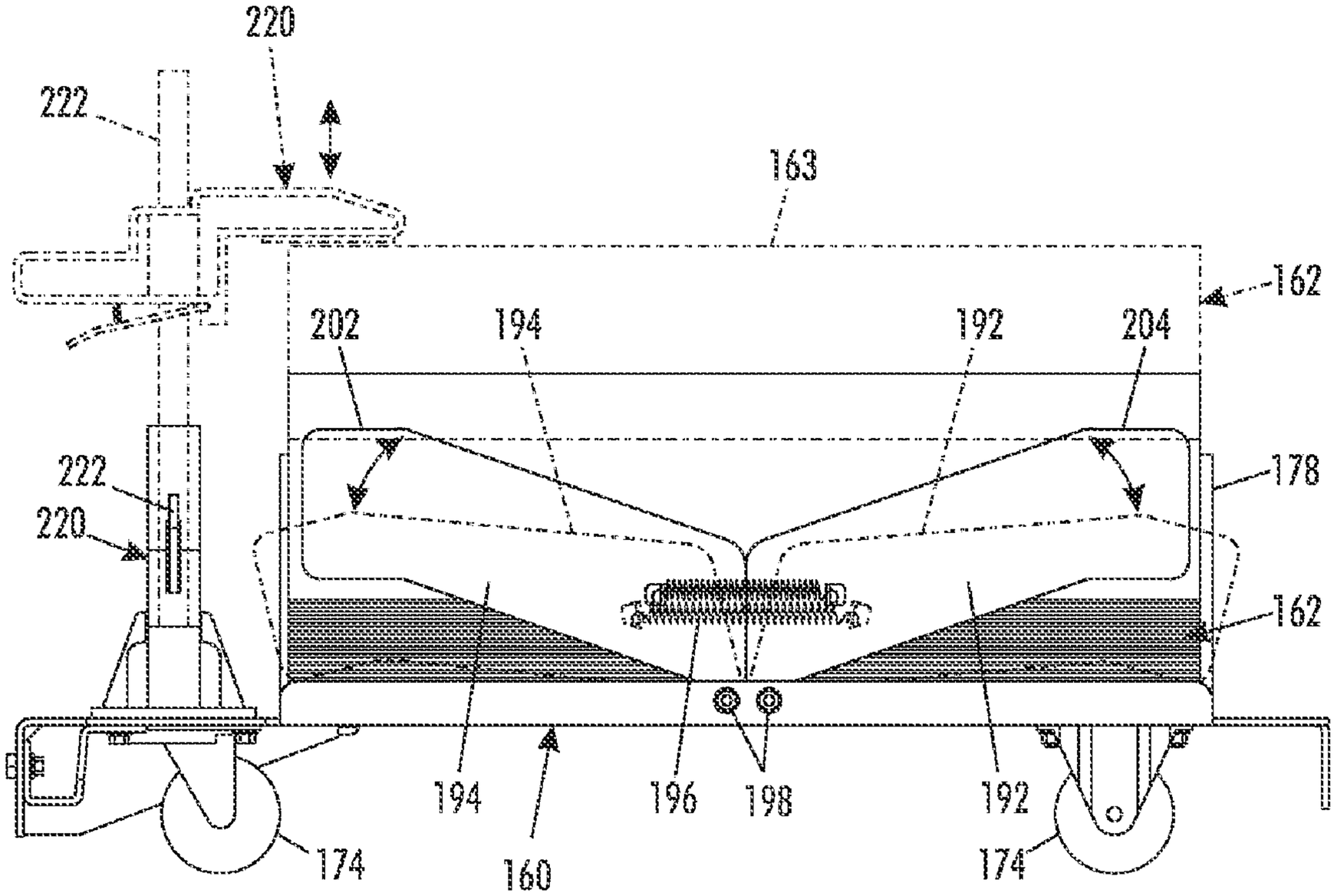
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FIG. 3

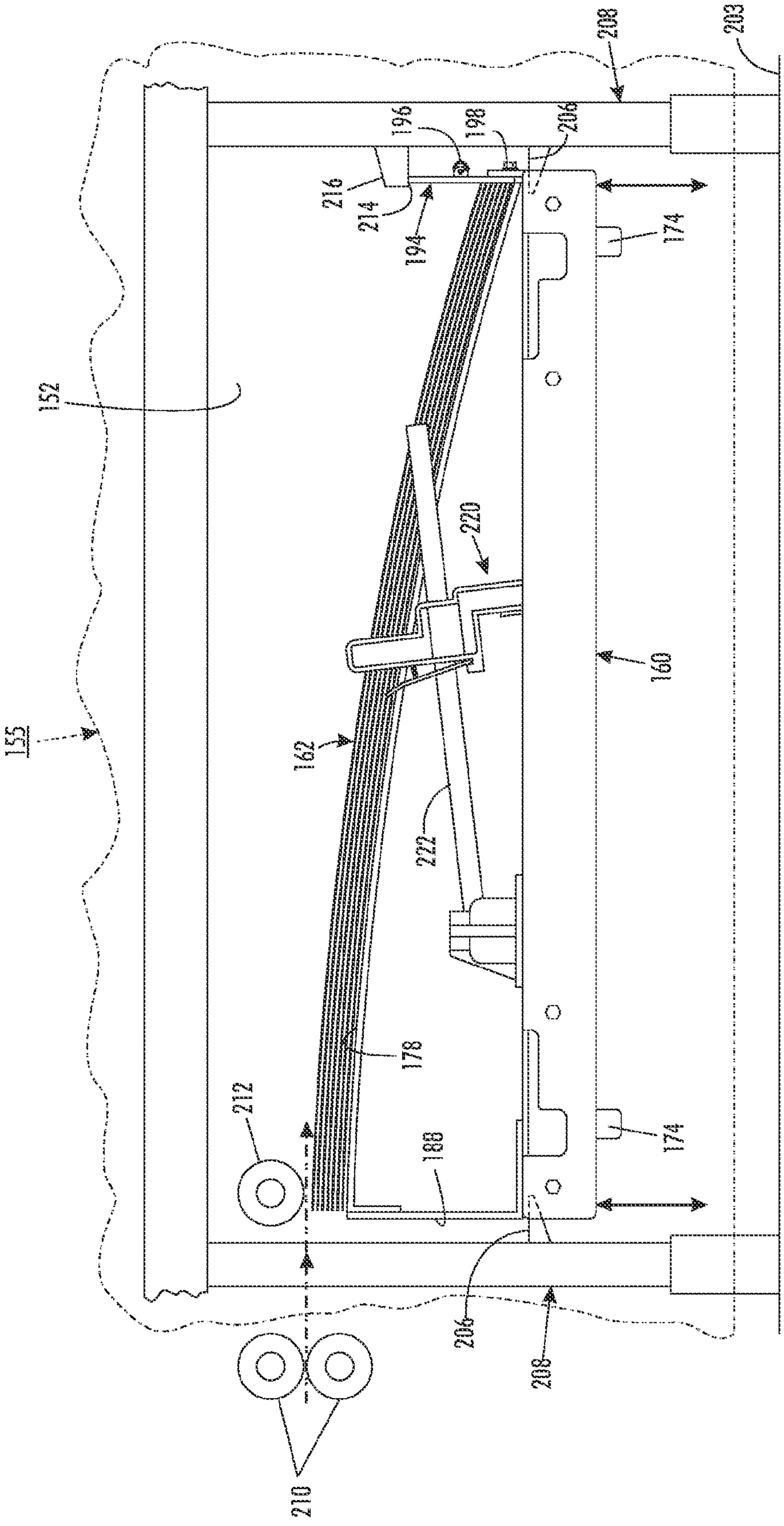
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FIG. 4

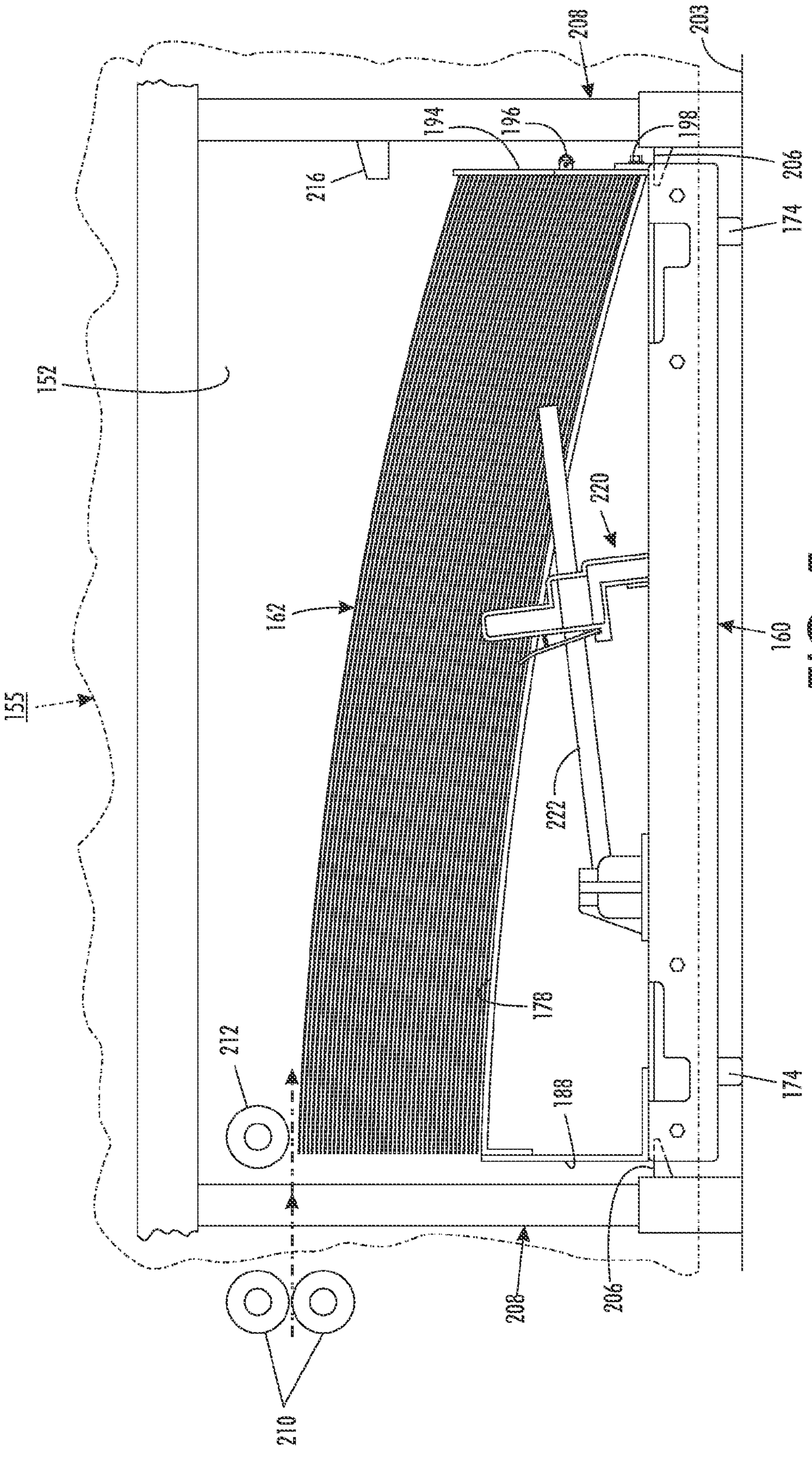
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FIG. 5

STACKER CARTS, PRINTING APPARATUSES, AND METHODS OF STACKING MEDIA ON STACKER CARTS

BACKGROUND

Stacker carts, printing apparatuses, and methods of stacking media on stacker carts are disclosed.

Stacker carts are used for stacking media in printing apparatuses. Such stacker carts can be loaded while positioned in spaces within such apparatuses. It would be desirable to provide stacker carts that can be used in a small space in a printing apparatus to stack longer printed media.

SUMMARY

According to aspects of the embodiments, stacker carts, printing apparatuses and methods of stacking media on stacker carts are disclosed. An exemplary embodiment of the stacker carts for stacking media comprises a stacking surface including a first end and an opposite second end, the stacking surface sloping downwardly from the first end toward the second end; and a resiliently-biased, movable stop disposed at the second end of the stacking surface, the stop including at least one contact surface defining a height of the stop above the second end. When the contact surface is in contact with a first surface, the height of the stop (i) decreases as the stacker cart is moved toward the first surface, and (ii) increases as the stacker cart is moved away from the first surface.

DRAWINGS

FIG. **1** illustrates an exemplary embodiment of a printing apparatus.

FIG. **2** illustrates an exemplary embodiment of a stacker cart with a stack of media depicted in phantom line.

FIG. **3** is a front elevation view of the stacker cart shown in FIG. **2**.

FIG. **4** illustrates the stacker cart shown in FIG. **2** in a raised position inside of a finisher module of a printing apparatus, with media stacked on the stacker cart.

FIG. **5** illustrates the stacker cart shown in FIG. **4** in a fully-lowered position inside of the finisher module, with additional media stacked on the stacker cart.

DETAILED DESCRIPTION

The disclosed embodiments include a stacker cart for stacking media, which comprises a stacking surface having a first end and an opposite second end, with the stacking surface sloping downwardly from the first end toward the second end; and a resiliently-biased, movable stop at the second end of the stacking surface. The stop includes at least one contact surface defining a height of the stop above the second end. When the contact surface is in contact with a first surface, the height of the stop (i) decreases as the stacker cart is moved toward the first surface, and (ii) increases as the stacker cart is moved away from the first surface.

The disclosed embodiments further include a stacker cart for stacking media, which comprises a base including a top surface; a stacking surface on the top surface, the stacking surface curving downwardly from a rear end to an opposed front end; and a stop disposed at the front end of the stacking surface. The stop includes a first portion having a first contact surface, a second portion having a second contact surface, and at least one spring connected to the first and second portions. At least one of the first and second contact surfaces defines a height of the stop above the front end. When the first and second contact surfaces are in contact with a first surface, (i) the height of the stop decreases as the stacker cart is moved toward the first surface, and (ii) the spring resiliently-biases the first and second portions to move and increase the height of the stop when the stacker cart is moved away from the first surface.

The disclosed embodiments further include a method of stacking media on a stacker cart comprising a stacking surface which slopes downwardly from a first end toward an opposite second end, and a resiliently-biased stop at the second end. The stop has at least one contact surface defining a height of the stop above the second end. The method comprises raising the stacking cart above a support surface to bring the contact surface into contact with a first surface and decrease the height of the stop; loading at least one medium onto the stacking surface; and lowering the stacking cart relative to the first surface such that the height of the stop increases.

FIG. **1** illustrates an exemplary printing apparatus **10** used to produce prints from media, such as coated or uncoated paper sheets. The apparatus **10** has a modular construction and includes paper feeder modules **20**, a printer module **20** adjacent the paper feeder modules **20**, an inverter module **40** adjacent the printer module **30**, an inserter module **50** adjacent the inverter module **40**, and a finisher module **55** adjacent the inserter module **50**.

In the apparatus **10**, the paper feeder modules **20** can feed media having various sizes (widths and lengths) and weights to the printer module **30**. In the printer module **30**, latent images are formed on a photoreceptor, such as a photoreceptor belt, using a light source, and dry developer material is used to form toner images on the photoreceptor. The toner images are transferred to a side of respective media fed through the paper path. The inverter module **40** manipulates media exiting the printer module **30** and either passes the media through to the inserter module **50**, or inverts and returns the media to the printer module **20**, where toner images are formed on the opposite side of these media to produce duplex prints. The inserter module **50** provides an additional media source for the printing process. Media that are inserted into the printing process at the inserter module **50** typically are not passed through the printer modules **20**, but are inserted in the process stream to build a finished stack. The finisher module **60** receives media fed through the printer module **30**, inverter module **40** and inserter module **50**. In the finisher module **60**, these media are loaded onto a removable stacker cart to form a stack. FIG. **1** shows a stacker cart **60** positioned in an opening inside of the finisher station **55**. Media **62** are stacked on the stacker cart **60**. The media can be off-set stacked, or stacked with no offset between sets, on the stacker cart **60**.

A stacker cart **160** according to an exemplary embodiment is shown in FIG. **2**. The stacker cart **160** includes a base **164** having a front edge **166**, rear edge **168** and opposed side edges **170**, **172**. The base **164** is typically a shaped metallic plate. The base **164** can alternatively be made of other suitably rigid materials, such as polymers. The stacker cart **160** includes rollers **174** attached to the base **164** at each corner to allow the stacker cart **160** to be moved on a surface, such as a horizontal floor, on which the stacker cart **160** is supported. The base **164** includes openings **176** configured to receive a handle member (not shown), which can be grasped by a user to move the stacker cart **160** on the surface.

The stacker cart **160** further includes a stacking surface **178**. Media **162** are stacked on the stacking surface **178** when the stacker cart **160** is positioned inside of the finisher station

55. The stacking surface **178** extends from a rear end **180** to a front end **182**. When the stacker cart **160** is positioned on a horizontal surface, the rear end **180** is located above the front end **182**. In the embodiment, the stacking surface **178** is the top surface of a curved plate **184**. The plate **184** can be made, e.g., of metals including steel, aluminum, and the like, or a sufficiently-rigid polymeric material. The distance, d_1, from top surface **186** of the base **164** to the rear end **180** of the stacking surface **178** can be, e.g., about 100 mm to about 105 mm. The front end **182** of the stacking surface **178** is positioned above the top surface **186** by a distance equal to the thickness of the plate **184**.

The plate **184** is supported on the top surface **186** by an upstanding wall **188**. As shown, the wall **188** can be a bracket attached to the tip surface **186** and the plate **184**. In other embodiments, the plate **184** and wall **188** can be a single piece of material.

In embodiments, the stacking surface **178** is configured to allow media that are longer than the length, d_2, of the base **164** from the front edge **166** to the rear edge **168**, to be stacked on the stacking surface **178** without extending outwardly beyond the rear edge **168**. In some embodiments, the stacking surface **178** is curved and convex shaped, as shown, such that the stacking surface **178** slopes downwardly from the rear end **180** to the front end **182**. In an exemplary embodiment, the stacking cart **160** has a length of about 21 in. (about 533 mm). In such embodiment, media **162** having a length of up to about 22.5 in. (about 572 mm) can be stacked on the stacking surface **178** without extending beyond the rear edge **168** of the stacker cart **164**. Accordingly, the stacker cart **160** can be used to stack media that are longer than the length of a space in which the stacker cart **160** is used. The stacking surface **178** typically has a width of about 11 in. (about 279 mm) to about 15 in. (about 381 mm), allowing media widths within this range to be stacked on the stacking surface **178**.

In other embodiments, the stacking surface **178** can be planar (not shown) along its entire length between the rear end **180** and the front end **182**. In such embodiments, the angle formed between the plane of the stacking surface **178** and the plane of the top surface **186** can be selected to provide the desired length of the stacking surface between the rear end and the front end. In an exemplary embodiment, when the stacker cart **160** has a dimension, d_2, of about 21 in., media having a length greater than 21 in., but less than 22.5 in., can be stacked on the planar stacking surface without extending forwardly beyond the rear edge **168** of the stacker cart **160**.

The stacker cart **160** further includes a stop **190** located at the front end **182** of the stacking surface **178** and the front edge **166** of the base **164**. The stop **190** is movable to change its height with respect to the front end **182** of the stacking surface **178**. The stop **190** is configured to prevent media **162** stacked on the stacking surface **178** from sliding off of the front edge **166** of the stacker cart **160**. By incorporating the stop **190** on the stacker cart **160**, media stacking capacity on the stacker cart **160** reduced by elevating the rear end **180** of the stacking surface **178** above the front end **182** to allow media that are longer than the base **164** to be stacked on the stacker cart **160**, can be reclaimed.

In embodiments, the stop **190** is resiliently-biased. The height of the stop **190** relative to the front end **182** of the stacking surface **178** is variable from a minimum height, when the stop **190** is in a fully-lowered position, to a maximum height, when the stop **190** is in a fully-raised position. In the minimum-height position of the stop **190**, a portion of the stop **190** can be located below the top surface **186** of the base **184**, with the remainder of the stop **190** located above the top surface **186**. When the stop **190** is brought into contact with a surface, the stacker cart **164** can then be raised toward the surface in order to push the stop **190** downwardly and decrease its height. Then, when the stacker cart **164** is lowered relative to the surface, the height of the stop **190** increases up to a maximum height when the stop **190** no longer contacts the surface.

As shown in FIG. **2**, in embodiments, the stop **190** includes a first portion **192** and a second portion **194**. As shown, the first portion **192** and second portion **194** can have a generally polygonal shape, such as rectangular.

As shown in FIG. **3**, in embodiments, a spring **196** is connected to the first portion **192** and second portion **194** of the stop **190**. The spring **196** exerts a force effective to resiliently bias the first portion **192** relative to the second portion **194** to vary the height of the stop **190**. The spring **196** is a tension spring shown in a contracted state. The first portion **192** and second portion **194** are caused to rotate about respective axes **198** in directions away from each other when the top surface **200** of the first portion **192** and the top surface **202** of the second portion **194** are brought into contact with a surface, which is typically stationary, when the stacker cart is being raised relative to the surface. This rotation of the first portion **192** and second portion **194** is depicted by arrows A and B, respectively, in FIG. **2**. In FIG. **3**, the first portion **192** and second portion **194** are shown in the fully-raised (maximum height) position in solid line, and in a lowered (reduced height) position in phantom line after being rotated downwardly, as depicted by arrows. Contact between the top surfaces **202**, **204** and the surface causes the height of the stop **190** to continuously decrease as the stacker cart **160** continues to be raised relative to the surface.

The height of the stop **190** is measured from the front end **182** of the stacking surface **178** to the highest point of the top surface **202**, or the top surface **204** above the front end **182**. That is, the height of the stop **190** is the maximum distance of the top surface **202** or top surface **204** above the front end **182** above the stacking surface **178**. The maximum height of the stop **190** in its fully raised position can be, e.g., about 185 mm to about 190 mm. As the height of the stop **190** decreases, the spring **196** is extended and the spring force increases. When the stacker cart **160** is at the fully-raised position, the stop **190** is at a minimum height, and the spring **196** is fully extended.

FIGS. **4** and **5** depict loading of media **162** onto the stacker cart **160** within an opening **152** of a finisher module **155** of a printing apparatus (such the finisher module **55** shown in FIG. **1**). FIG. **4** shows the stacker cart **160** after it has been raised to a position above a surface **203** on which the finisher module **155** is supported. The stacker cart **160** is raised and lowered with respect to the surface **203** by a lift mechanism including lift members **206** that move vertically on tracks **208**. The lift members **206** are configured to engage the base **164** of the stacker cart **160**. In the raised position of the stacker cart **160** shown in FIG. **4**, media **162** are automatically stacked on the stacking surface **178** by feeding the media **162** via the rolls **210** and **212**. As shown, the stacked media **162** abut the second portion **194** of the stop **190** (and also the first portion **192**). In the raised position, the second portion **194** (and also the first portion **192**) abut a surface **214** of a stop member **216** provided on one of the tracks **208**. In this raised position of the stacker cart **160**, the first portion **192** and second portion **194** of the stop **190** are in lowered positions, such as shown in FIG. **3** in phantom line.

As media continue to be stacked on the stacker cart **160**, the stacker cart **160** is lowered with respect to the surface **214**. As the stacker cart **160** is lowered, the spring **196** continues to contract and apply a tensile force to the first portion **192** and second portion **194**, causing these portions to rotate toward

each other (i.e., from the phantom line position to the solid line position in FIG. **3**). That is, in the view shown in FIG. **3**, the first portion **192** rotates counter-clockwise, and the second portion **194** rotates clockwise as the stacker cart **160** is lowered. This rotation of the first portion **192** and second portion **194** toward each other increases the height of the stop **190**. By the height of the stop **190** increasing by lowering of the stacker cart **160**, additional media **162** can be stacked on the stacking surface **178** until loading of the stacker cart **160** is completed.

FIG. **5** shows the stop **190** in its maximum-height position after the stacker cart **160** has been lowered onto the surface **203**. In this position of the stop **190**, the stacker cart **160** can be fully loaded, as shown. The stacker cart **160** can then be removed from the opening **152** of the finisher module **155**. Typically, media having a total thickness of, e.g., about 180 mm to about 190 mm can be stacked on the stacking surface **178**.

In other embodiments, the stop can be a single-piece of material, e.g., a metal or plastic material. In such embodiments, the stop is lowered by bringing the top surface of the stop into contact with a surface, as the stacker cart is raised toward the surface. The stop can be resiliently biased by a compression spring, for example. The compression spring is compressed as the stop is pushed downwardly as the stacker cart is raised. When the stacker cart is in the raised position, media can be loaded onto the stacking surface. The stacker cart can be lowered with respect to the surface and continue to be loaded with the media. As the stacker cart is lowered, the compression spring expands, thereby raising the stop relative to the top surface of the base. This movement of the stop increases its height relative to the top surface, allowing additional media to be stacked on the stacking surface efficiently.

In embodiments of the stacker cart including a multi-piece stop or embodiments including a single-piece stop, movement of the variable-height stop allows the stacker cart to be raised relative to a surface to bring the stacking surface close to the surface so that media can be stacked on the stacking surface.

As shown in FIGS. **2** to **4**, in embodiments, the stacker cart **160** can include a clamp **220** provided on the base **164** for clamping media stacked on the stacking surface **178** to prevent the media from falling off of the stacker cart **160**. The clamp **220** is mounted on an arm **222**. The arm **222** can be rotated and pivoted with respect to a fixed base **224** attached to the base **164** to place the clamp **220** in contact with the top surface of the stack of media **162**, as shown in phantom line in FIG. **3**.

It will be appreciated that various ones of the above-disclosed and other features and functions, or alternatives thereof, may be desirably combined into many other different systems or applications. Also, various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art, which are also intended to be encompassed by the following claims.

What is claimed is:

1. A stacker cart for stacking media, comprising:

a stacking surface including a first end and an opposite second end, the stacking surface sloping downwardly from the first end toward the second end; and

a resiliently-biased, movable stop disposed at the second end of the stacking surface, the stop including at least one contact surface defining a height of the stop above the second end, a first portion having a first contact surface, a second portion having a second contact surface, and at least one spring secured to the first portion and second portion, the spring resiliently-biases the first portion and the second portion to move toward each other when the stacker cart is moved away from the first surface;

wherein, when the contact surface is in contact with a first surface, a height of the stop (i) decreases as the stacker cart is moved toward the first surface, and (ii) increases as the stacker cart is moved away from the first surface.

2. The stacker cart of claim **1**, wherein the stacking surface is a curved, convex-shaped surface.

3. The stacker cart of claim **1**, wherein the stacking surface is planar.

4. The stacker cart of claim **1**, further comprising:

a base including opposed first and second edges defining a length of the base;

wherein the first end of the stacking surface is disposed at the first edge, the second end of the stacking surface is disposed at the second edge, and the stacking surface has a length from the first end to the second end which exceeds the length of the base.

5. The stacker cart of claim **1**, wherein:

the first portion rotates in a first direction and the second portion rotates in an opposite second direction when the first and second contact surfaces are in contact with the first surface and the stacker cart is moved toward the first surface to decrease the height of the stop; and

the first portion rotates in the second direction and the second portion rotates in the first direction when the stacker cart is moved away from the first surface to increase the height of the stop.

6. The stacker cart of claim **1**, further comprising:

a plurality of rollers attached to the base and adapted to movably support the stacker cart on a support surface; and

a clamp provided on the base for clamping media stacked on the stacking surface.

7. A printing apparatus, comprising:

a finisher station including an opening, the first surface disposed inside the opening, and a lift mechanism; and

a stacker cart according to claim **1** removably disposed in the opening and which is raised and lowered with respect to the first surface by the lift mechanism.

8. A stacker cart for stacking media, comprising:

a base comprising a top surface;

a stacking surface on the top surface, the stacking surface curving downwardly from a rear end to an opposed front end; and

a stop disposed at the front end of the stacking surface, the stop including a first portion having a first contact surface, a second portion having a second contact surface, and at least one spring connected to the first and second portions, at least one of the first and second contact surfaces defining a height of the stop above the front end;

wherein, when the first and second contact surfaces are in contact with a first surface, (i) the height of the stop decreases as the stacker cart is moved toward the first surface, and (ii) the spring resiliently-biases the first and second portions to move and increase the height of the stop when the stacker cart is moved away from the first surface.

9. The stacker cart of claim **8**, wherein:

the base includes a rear edge and an opposed front edge defining a length of the base; and

the rear end of the stacking surface is disposed at the rear edge, the front end of the stacking surface is disposed at

the front edge, and the stacking surface has a length from the rear end to the front end which exceeds the length of the base.

10. The stacker cart of claim **8**, wherein:

the first portion rotates in a first direction and the second portion rotates in an opposite second direction when the first and second contact surfaces are in contact with the first surface and the stacker cart is being moved toward the first surface; and

the first portion rotates in the second direction and the second portion rotates in the first direction when the stacker cart is moved away from the first surface.

11. The stacker cart of claim **8**, further comprising:

a plurality of rollers attached to the base and adapted to movably support the stacker cart on a support surface; and

a clamp provided on the base for clamping media stacked on the stacking surface.

12. A printing apparatus, comprising:

a finisher station including an opening, the first surface disposed in the opening, and a lift mechanism; and

a stacker cart according to claim **8** removably disposed in the opening and which is raised and lowered with respect to the first surface by the lift mechanism.

13. A method of stacking media on a stacker cart comprising a stacking surface which slopes downwardly from a first end toward an opposite second end, and a resiliently-biased stop at the second end, the stop including at least one contact surface defining a height of the stop above the second end, a first portion having a first contact surface, a second portion having a second contact surface, and at least one spring connected to the first portion and second portion, the spring resiliently-biases the first portion and the second portion (i) to move away from each other so as to decrease the height of the stop when the stacker cart is toward the first surface, and (ii) to move toward each other so as to increase the height of the stop when the stacker cart is moved away from the first surface, the method comprising:

raising the stacking cart above a support surface to bring the contact surface into contact with a first surface and decrease the height of the stop;

loading at least one medium onto the stacking surface; and

lowering the stacking cart relative to the first surface such that the height of the stop increases.

14. The method of claim **13**, wherein the medium is paper having an image thereon.

15. The method of claim **13**, wherein the first surface is disposed inside of an opening of a finisher station of a printing apparatus.

16. The method of claim **15**, further comprising:

prior to raising the stacking cart toward the first surface, placing the stacker cart in the opening of the finisher station;

after loading the medium onto the stacking surface, stacking a plurality of additional media onto the stacking surface as the stacker cart is being lowered away from the first surface toward the support surface; and

removing the stacker cart from the opening after the stacker cart has been lowered onto the support surface.

17. The method of claim **13**, wherein the stacking surface has a curved, convex shape from the first end to the second end.

18. The method of claim **13**, wherein the stacking surface has a planar shape from the first end to the second end.

19. The method of claim **13**, wherein:

the stacker cart further comprises a base including a first edge and an opposed second edge defining a length of the base;

the first end of the stacking surface is disposed at the first edge, the second end of the stacking surface is disposed at the second edge, and the stacking surface has a length from the first end to the second end which exceeds the length of the base; and

the medium has a length equal to about the length of the stacker surface.

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